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VOL. V. NO. 16. JULY 30, 1908.

THE JOURNAL OF PHILOSOPHY
PSYCHOLOGY AND SCIENTIFIC METHODS

THE PART PLAYED BY CONSCIOUSNESS IN MENTAL OPERATIONS

THAT each consciousness is to itself a unity has long been recognized. It has also been understood in a general way that consciousness helps to coordinate and unify cerebral activities. It has, however, been often disputed whether attention may be given to more than one process at one time. This question is transformed by investigations of cases of double consciousness and by recent controversies regarding the subconscious into that of whether there can be two separate unifying consciousnesses acting at the same time in the same brain. The case reported by Dr. Prince in this JOURNAL, of January 30, may very well serve as a test case for deciding these disputed points and for determining the real part that consciousness plays in mental operations.

In this case it appears that two rather complex operations were performed at the same time and, according to Dr. Prince's view of the case, one operation, that of writing a poem, was directed by one unified consciousness designated as *A*, while another unified consciousness, called *b*, was engaged in performing the mathematical operation of computing the number of seconds elapsing between 3:15 and 4:33. Consciousness *A*, according to its own testimony and so far as could be observed by others, was fully occupied with copying a poem and knew nothing of the significance of the figures expressing the time which were written on the margin of the paper. Consciousness *b* had, however, been informed that such a problem would be given, and when evoked at the close of the writing of the poem reported at once the solution of the problem. If it be admitted that such a mental operation as solving a problem of this kind can be carried on successfully only under the direction of consciousness, as Dr. Prince seems to assume, then there is no way of avoiding his conclusion that while the ordinary consciousness is seemingly occupying the whole field and doing its work, another consciousness, designated by the term "subconscious," may be directing other operations. If this is admitted the way is open for all kinds of suppositions regarding the performance of operations by a consciousness separated from the primary consciousness. If, however, such operations may be carried on successfully by the physiological mechanism without the direction of consciousness, then there is no reason to use the term subconscious in the sense of a consciousness directing operations without the knowledge of the primary consciousness.

In the case of acts that have been performed a great many times it is admitted that the physiological mechanism may carry on successfully quite complex operations, with little if any supervision by consciousness. We perform a multitude of acts every day that at one time could be performed successfully only by close attention, while our attention is focalized on something else, and there is nothing more than a marginal consciousness of the familiar operations in which we are engaged, and in some instances even a marginal knowledge of the performance of those operations seems to be absent. When learning to read, consciousness was completely focalized upon the process, but most adults have frequently had the experience of reading a page while intently thinking of some other subject. In the case of many persons almost any process may be so completely mechanized that it can be performed as well or better without attention as when consciousness undertakes to supervise the process. A good illustration of this is that of the short-hand court reporter who, after he became expert at taking down testimony, trained himself to do so while he gave his thought to other matters. He was thus able to take the testimony and at the same time converse with a friend. He gave no attention to his work and yet took down every word with as much accuracy as a phonograph.

Persons who attempt to do two things at once, such as writing a poem and solving a problem, usually find that they can do so with greater or less success. In most persons there seems to be a consciousness of the two processes and the consciousness is focalized upon the most difficult or least familiar of the two processes or it changes from one process to the other whenever the difficulties presented make it necessary. Some persons, however, who have practised doing two things at a time, seem to be able to produce a double focalization within the single consciousness. If the two focalized phases of this consciousness were separated so that one was not marginal to the other, then we should have the condition which Dr. Prince describes as existing in the case he has reported. On theoretical grounds it can not be denied that such a division of a consciousness into two parts is possible. On the other hand, the possibility should not be admitted as an actuality without convincing proof. Evidence from the subjective side, so far as it is pertinent, should perhaps be regarded as conclusive, but if the two states of consciousness are entirely separate, then one can give no testimony regarding the existence of the other. It is only where one consciousness is marginal to the other that any testimony can be given regarding the existence of the other consciousness. The existence of a consciousness entirely separate from another consciousness must be shown objectively, therefore, by proving that processes not known to the existent consciousness and that could not be performed without consciousness, are actually performed.

It is pretty generally recognized that physiological laws control the association of ideas as well as the performance of habitual acts. The helplessness of consciousness is impressed upon one by the familiar experience of unsuccessful effort in trying to recall a familiar name. Those who persist in trying to recall a name do so by trying to focalize consciousness upon something connected with the name. If they can succeed in focalizing upon something that has been many times associated with the name, the physiological apparatus responds by presenting the name to consciousness. Many persons find that the name is more likely to be presented if they cease trying to bring it into consciousness and focalize upon something else. It is also a common experience to be asked a question and to say that we do not know, and then, a little later, without any further conscious thought upon the matter, suddenly to realize that we do know the answer. Facts such as these, indicating that what is presented to consciousness is determined by physiological processes, are common not only where associations have been formed by previous experience, but also when we are searching for new ideas. In writing an article one holds in mind what he is trying to do and notes the relevance of ideas as they come and directs thought by accepting what is relevant and rejecting what is not. It is not unusual for a person who has been trying to solve a problem in mathematics, science, mechanics, art, or literature suddenly to become conscious of the solution. This may occur when the mind is for the time being occupied with some other subject, and it may occur immediately after waking from sleep. In exceptional cases the solution of the problem has been worked out on paper during sleep, and in others has been presented in the form of a dream. It is not at all unusual for poets and novelists to report that the poem or plot of the novel comes to them ready made instead of being consciously constructed bit by bit.

Such facts as the above indicate that in new as well as in familiar activities the content of consciousness is not determined primarily by consciousness itself, but by the action of the physiological mechanism. It is, however, going entirely too far to say that consciousness has no control whatever over its content. Every one knows that he can, to a considerable extent, determine what the content of his consciousness shall be, however powerless he may be in certain cases.

The manner in which consciousness may do this and in fact the real part that consciousness plays in mental operations may be suggested by a comparison of the physiological mechanism with other machines. It is a well-known fact that a properly constructed machine may be made to perform not only single operations with great accuracy, but a long series of complex operations. The same machine may also be made to do a number of different things by a slight change in its adjustment or the connection between its parts. There is good reason for believing that the brain is just such a machine, with the exception that it is infinitely more complex than any inorganic mechanism, and with the further exception that what it can do is determined not only by its original structure, but also by the changes produced in it by its previous activities. There is every reason to believe that the possibility of performing any mental operation, simple or complex, new or old, depends upon the structure and functioning of the nervous system. Consciousness can not do of itself or cause the nervous system to do anything which its nervous structure does not fit it to perform.

The real function of consciousness, in the performance of mental operations, is suggested by reaction-time experiments. When one prepares to react by a certain motion to a given signal he is very likely to react before the signal is given or in response to some other signal. This would seem to indicate that the apparatus has been set to do a certain thing, and whenever the mechanism is started, by whatever means, it does that thing without direction of consciousness. After it is done, consciousness is aware of the act and knows whether it corresponds or does not correspond to the intention. We see, therefore, that consciousness adjusted the apparatus for the performance of the act and received a report of what was done, but that it had nothing whatever to do with the actual performance of the act. Common experience shows that such adjustment may be made a long time before the act is to be performed. This is true when one says, "When I put on my coat to come home I must do a certain errand," or, "When I see a person I must give him a message." Without any further thought about the matter such adjustments may result in the performance of the act at the proper time. Adjustments may also be effective after an interval of unconsciousness, as when one resolves to waken at a certain signal and does so. Any one by practise will become able thus to respond to a particular stimulus, as, for example, the stirring of a patient, by awakening, and some persons can do so without practise. It is also true that some persons can set themselves to waken at a certain hour and do so with almost as great certainty as that with which an alarm clock strikes at the time for which it is set. Adjustments for more complex processes are sometimes made by speakers who prepare a speech to be delivered at a certain time and place, and give little or no thought to the matter until the time comes.

Adjustments may also be made for responding to certain stimuli without reference to the time or place when such response is to be given. A good illustration of this is given by John Burroughs. He had become interested in hylas. He says: "One Sunday, walking amid some bushes, I captured two. They leaped before me as doubtless they had done many times before, but though not looking for or thinking of them, yet they were quickly recognized because the eye had been *commissioned* to find them. On another occasion, not long afterward, I was hurriedly loading my gun in the October woods in the hopes of overtaking a gray squirrel that was fast escaping through the tree tops, when one of these lilliput frogs, the color of the fast-yellowing leaves, leaped near me. I saw him only out of the corner of my eye and yet bagged him because I had already made him my own."

If it should be admitted that consciousness does nothing in the way of controlling the mental operations except (1) to adjust the cerebral apparatus for the performance of the act by focalizing upon the thing to be done, and (2) to note the result, as conforming or not conforming with that intended, then we can easily explain such cases as that reported by Dr. Prince without supposing the existence of a subconsciousness directing operations without the knowledge of the ordinary consciousness. The subject described by him perhaps differed from other persons chiefly in the fact that the cerebral apparatus had been trained in the simultaneous performance of separate, unrelated acts, to a greater extent than that of most people. Consciousness could adjust the nervous apparatus for the performance of one act, then concern itself with other processes. The adjustment having been made, when the figures that were to be the signal for performing the act were presented, the act was perhaps carried out without any supervision by consciousness, and later reported. The case does not differ from that of ordinary experience except in the fact that usually we can not adjust the nervous apparatus for performing such a complex act so completely that it will be performed successfully without some marginal or focal consciousness of the partial results whose proper linking together constitute the successful progress toward the result planned. Dreams usually lack cohesion because there has been no adjustment for the accomplishment of a definite end, or because there is no report of what is done at each stage or readjustment by consciousness to lead to the end planned. Sometimes, however, the adjustment of the cerebral apparatus, because of recent interest in solving some problem, is such that problems are completely solved in dreams. Some people are able to exercise some control over their dreams. If this power were developed and practised until they could set themselves to dream the answer to questions that might be asked, they would be in a condition similar to that of Dr. Prince's subject.

If it be admitted that the function of consciousness is to adjust the nervous apparatus for the performance of certain acts and to note whether the results correspond or lead to those anticipated, then the phenomena of dreams, hypnotism, double consciousness, and so-called subconsciousness do not differ essentially from ordinary mental operations. Everything that the mind does is the result of physiological functioning, and consciousness does nothing but adjust the mechanism and note the results. Ordinarily it must do this at every step in the performance of a complex process and adjustment, for the performance of only one process at a time is made, but under exceptional circumstances or because of special training the physiological apparatus may perform very complex operations without consciousness directing the partial readjustments at each stage of progress, and it may perform more than one non-habitual act simultaneously.

The seemingly prominent part that consciousness plays in all new and complex activities is probably in part illusory. The intentions which produce the adjustments of the apparatus and the steps in the processes follow one another so closely that it seems as if consciousness were doing the whole thing. In reality the case is probably similar to that which makes one feel as if he were the active agent in all that is being done by a machine that he is controlling, when, as a matter of fact, he makes only a few slight movements and the mechanism does the rest. In a similar way consciousness is continually adjusting the cerebral mechanism by focalizing on one or another element that is presented and noting its relation to the end in view, but everything that is brought to consciousness is brought there by the working of the physiological mechanism.

Believers in the subconscious will doubtless say that thus far the most important evidence of the existence of consciousness in connection with the performance of operations that are carried on outside of the primary consciousness, has not been mentioned. This fact is that not only has the operation been performed, but in a hypnotic state subjective details can be given of how it was performed and of the feelings accompanying its performance. This is undoubtedly a feature of the phenomena of great importance, yet there are many facts of a normal experience of a similar nature. We sometimes understand what a person has said a short time after the words were uttered when we did not understand them at the time.

We may also be able to report details of what we have seen, but we are not conscious in the original perception of having noticed them. Memory of what was not consciously learned is by no means unusual, as illustrated by the classical example of the ignorant servant girl repeating, while in a fever, passages in Greek and Latin that she did not know anything about in her ordinary consciousness, she having incidentally heard these passages repeated by her master. An example from common experience similar to this is that of a man in whose presence an item of local news was mentioned while his attention was occupied with something else. A little later he told this news to the family, and when asked where he read it said that he believed he read it in the paper.

It is generally admitted that memory depends upon the reactivity of at least a part of the same apparatus that was active in the original experience. It may be claimed, therefore, not without reason, that it matters not whether consciousness was present or not, at the time of the original functioning. If consciousness is present when the apparatus is made to function again in a similar way, it may be able to report details that would have been known at the time, had consciousness been present.

It is true that it is a serious matter to refuse to accept the subjective testimony of consciousness regarding itself. The question here raised, however, is not as to reliability of direct introspection, but as to the testimony of consciousness as to its states when a process that is now remembered was being performed. Undoubtedly there are various degrees of reliability to be attached to the testimony of the consciousness of different people regarding past experiences. There is reason for thinking that the testimony of those who are exceptional to such an extent that they can perform complex operations without any normal consciousness of their being done, is likely to be less reliable than that of more normal people.

The possibility of mental operations taking place in practically the same way at one time with, and, at another, without, consciousness must be given due weight in considering this question. We know that this is possible in the case of a large number of automatic and habitual acts such as breathing and writing, which are usually performed with little or no direction, and sometimes without the awareness of consciousness, but which may at any moment be brought under conscious control. Some individuals find it more difficult to learn what they try to learn than that which they make no effort to acquire. One, who by the greatest effort is unable to learn the simplest mathematical processes, may, without any effort on his part, compose poems, stories, or essays, beautiful in sentiment and language. Again, it is not at all unusual for the brain, when once started to working in a certain way, to go on working out the solution to some problem in spite of the efforts of consciousness to direct the activity in another line.

Conscious control of mental operation, so far as it exists, is largely acquired by experience, and to perform without consciousness may be also developed by training. Conscious control of such functions as the shedding of tears and the beating of the heart that are usually entirely beyond the control of consciousness, may be acquired by some individuals, so other individuals may acquire the power of carrying on complex operations such as are usually performed only under the direction of a focalized consciousness without being aware that the operation is being performed, being wholly occupied with the direction of some other operation. It is probable that most of the subjects of hypnotic experiment have had a good deal of training in the performance of complex acts without conscious direction. Very slight changes in the adjustment of the cerebral apparatus are sufficient to bring about very marked changes in the processes performed. The hypnotizer is one who is skillful in arranging conditions so as to bring about the desired adjustment. The hypnotic subject becomes a good performer in proportion as his cerebral apparatus is trained in functioning without the direction of his own consciousness, but in response to suggestion of the hypnotizer. The skilled hypnotizer trains the nervous mechanism of his subject so that it can perform quickly and accurately the various processes without the interference of the subject's own consciousness.

The term ''physiological functioning'' may mean practically the same thing as ''subconscious.'' Were the term subconscious used merely to indicate *processes* carried on without the knowledge of the normal consciousness, the term would be convenient and unobjectionable. When, however, the term is used to indicate *states of consciousness* unknown to the primary consciousness, we have an entirely different conception from the physiological one. It is true that both terms are used to indicate processes of which we know but little, yet it is important to know which term and which conception is likely to lead most surely to complete and accurate knowledge of the nature of these unknown processes. It is also of vital importance to the science of psychology to decide this question, because it is very closely bound up with the more fundamental question of the real function of consciousness in all mental operations.

It is doubtful whether objective evidence can do anything more than establish the probability or improbability of consciousness being present in any given case. There is reason for thinking that the nervous apparatus working without consciousness may, under favorable circumstances, perform almost any sort of an act that can be performed with consciousness. Without consciousness, however, the performance of complex processes in a coordinated way, especially when they involve a new mode of functioning, will be rare exceptions instead of the usual thing.

One's judgment is likely to be influenced in considering the existence of subconsciousness by the number of facts brought to his attention of complex processes that seem to be directed by physiological laws only, as compared with the number of facts indicating that there was a consciousness unknown to the ordinary consciousness supervising the process and able afterwards to report details of how it was done. Dr. Prince being familiar with many facts that appear to be of the latter kind, naturally believes in the subconscious in the sense of the coconscious. Perhaps his unusual familiarity with facts of that kind warps his judgment as much as Dr. Pierce's lack of familiarity with such facts makes him, in the opinion of Dr. Prince, unable to interpret such facts. The subconscious explanation is readily used and difficult to test in any reliable way, while the physiological explanation with improvement in neurological methods will be able to apply exact objective test to the phenomena. Hence unless the mass of evidence is overwhelmingly in favor of the subconscious explanation, it seems safer for the scientist to attempt to use the physiological explanation until more is known.

It is especially important, now that comparative and genetic psychology are receiving so much attention, that the real function of consciousness should be determined. It is to be hoped that the discussions regarding the subconscious will not become a mere dispute about terms, but will lead to a more definite conception of the part played by consciousness in the behavior of men and of animals of all grades.

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TRUTH VALUE[1]

AS I read the invitation of the program committee to prepare a paper on "Truth-Value" I thought at first: "How delightful to have a subject so free from the dust and blood of the arena." For however much we may disagree, and however little we may know about the nature and the criterion of truth, we are all sure of its great "value." We are all prepared to say, as one of Pro-

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[1] One of a series of papers read at a symposium on value held at the holiday meeting of the Western Philosophical Association, in Chicago, December 31, 1907, and January 1, 1908.